Monthly Labor Review mlr BLS

BLS

June 2018

Producer prices, 2017: inflation accelerates across the stages of production

Using data from the Producer Price Index program, this article describes changes in producer prices in 2017. That year, final-demand prices for goods, services, and construction advanced at faster rates than they had in 2016. Within intermediate demand, producer inflation also accelerated for processed goods and services inputs destined for the business sector.

Joseph Kowal
kowal.joseph@bls.gov

Joseph Kowal is an economist in the Office of Prices and Living Conditions, U.S. Bureau of Labor Statistics.

Lana Conforti
conforti.lana@bls.gov

Lana Conforti is an economist in the Office of Prices and Living Conditions, U.S. Bureau of Labor Statistics.

Brian Hergt
hergt.brian@bls.gov

Brian Hergt is an economist in the Office of Prices and Living Conditions, U.S. Bureau of Labor Statistics.

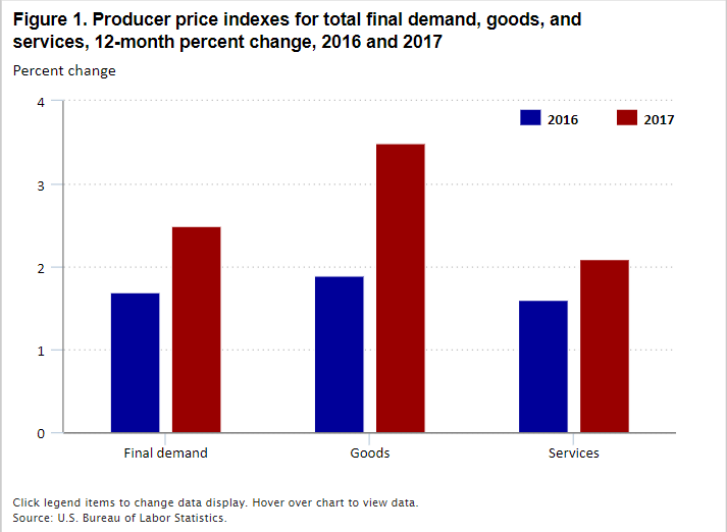
The Producer Price Index (PPI) measures the average change over time in the selling prices that domestic producers receive for their output. The indexes of the Final Demand–Intermediate Demand (FD–ID) aggregation system, used to analyze the behavior of producer prices, measure final-demand inflation (price changes for goods, services, and construction sold for personal consumption, as capital investment, to government, and for export) and intermediate-demand inflation (price changes for goods, services, and construction sold to businesses as inputs to production). This article describes PPI price movements in 2017.[1]

Overview

Producer inflation accelerated in 2017, as the PPI for final demand climbed 2.5 percent, after moving up 1.7 percent in 2016. Over 70 percent of the faster rate of increase can be traced to prices for final-demand goods, which rose 3.5 percent, after advancing 1.9 percent in 2016.

Within the goods-producing sector in 2017, the acceleration in producer inflation was broadbased. During the year, prices for final-demand energy increased 10.1 percent, following a 6.3-percent rise in 2016. The index for final-demand foods turned up 2.0 percent in 2017,

after falling 1.6 percent a year earlier. Prices for final-demand goods other than foods and energy moved up 2.2 percent, after advancing 1.7 percent in 2016.[2] (See figure 1 and table 1.)



Scott Sager
sager.scott@bls.gov

Scott Sager is a supervisory economist in the Office of Prices and Living Conditions, U.S. Bureau of Labor Statistics.

Table 1. Selected producer price indexes for final demand and intermediate demand, 12-month percent change, 2016 and 2017

Index	2016	2017
Final demand		
Total final demand	1.7	2.5
Goods for final demand	1.9	3.5
Foods	-1.6	2.0
Energy goods	6.3	10.1
Goods less foods and energy	1.7	2.2
Services for final demand	1.6	2.1
Trade services	1.0	1.8
Transportation and warehousing services	1.1	2.3
Services less trade, transportation, and warehousing	2.0	2.3
Construction for final demand	0.5	3.1
Intermediate demand, by type of commodity		
Processed goods for intermediate demand	1.8	5.0
Processed foods and feeds	-0.4	1.0
Processed energy goods	4.2	13.5
Processed materials less foods and energy	1.6	3.6
Unprocessed goods for intermediate demand	13.0	5.0
Unprocessed foodstuffs and feedstuffs	-1.8	3.0
Unprocessed energy materials	34.7	4.1
Unprocessed nonfood materials less energy	13.7	8.5
Services for intermediate demand	2.6	2.9
Trade services for intermediate demand	0.6	4.0

See footnotes at end of table.

Table 1. Selected producer price indexes for final demand and intermediate demand, 12-month percent change, 2016 and 2017

Index	2016	2017
Transportation and warehousing services for intermediate demand	0.2	2.9
Services less trade, transportation, and warehousing for intermediate demand	3.5	2.8
Construction for intermediate demand	2.3	1.3
Intermediate demand, by production flow		
Stage-4 intermediate demand	1.7	3.4
Total goods inputs to stage-4 intermediate demand	1.1	3.4
Total services inputs to stage-4 intermediate demand	2.4	3.2
Stage-3 intermediate demand	2.0	4.8
Total goods inputs to stage-3 intermediate demand	1.8	6.3
Total services inputs to stage-3 intermediate demand	2.1	3.3
Stage-2 intermediate demand	6.4	3.7
Total goods inputs to stage-2 intermediate demand	11.1	5.1
Total services inputs to stage-2 intermediate demand	3.2	2.7
Stage-1 intermediate demand	4.4	5.7
Total goods inputs to stage-1 intermediate demand	6.4	8.1
Total services inputs to stage-1 intermediate demand	2.1	2.6

Source: U.S. Bureau of Labor Statistics.

In the service-providing sector, a larger rise in the index for final-demand trade services—1.8 percent in 2017, compared with a 1.0 percent rise in 2016—accounted for over half of the acceleration in the rate of price increase for final-demand services. This index climbed 2.1 percent in 2017, after moving up 1.6 percent in the preceding year. (Trade indexes measure changes in margins received by wholesalers and retailers.[3]) Also contributing to the faster rate of increase in 2017 were the indexes for final-demand services less trade, transportation, and warehousing—which moved up 2.3 percent, after climbing 2.0 percent in 2016—and final-demand transportation and warehousing services—which increased 2.3 percent, following a 1.1-percent rise a year earlier.

The index for final-demand less foods, energy, and trade services rose 2.3 percent in 2017, after advancing 1.8 percent in 2016. Historically, the indexes for food, energy, and trade services have displayed greater short-term volatility than other components of the FD–ID system. As a result, PPI calculates many indexes that exclude these potentially volatile components.[4]

As was the case with prices for final-demand goods and services, the indexes for intermediate-demand goods and services generally exhibited stronger inflationary tendencies in 2017 than in 2016. The index for processed goods for intermediate demand climbed 5.0 percent, compared with a 1.8-percent rise in 2016. Prices for processed core goods and processed energy goods moved up at faster rates than they had in 2016. The index for processed foods and feeds turned up in 2017, after falling a year earlier. For unprocessed goods for intermediate demand, the index increased 5.0 percent in 2017, following a 13.0-percent rise in the prior year. (Prices for some basic industrial materials, including natural gas, crude petroleum, and ferrous metal scrap began surging during the fourth quarter of 2016.) The indexes for unprocessed energy materials and unprocessed core goods climbed at slower rates in 2017 than they had a year earlier. Prices for unprocessed

foodstuffs and feedstuffs turned up, after falling in 2016. For intermediate demand services, the inflation rate rose to 2.9 percent in 2017, up from 2.6 percent a year earlier. Margins for trade services and the index for transportation and warehousing services moved up more than they had in 2016, while prices for services other than trade, transportation, and warehousing, advanced less in 2017 than they had a year earlier.[5]

Economic background

This section describes economic events that influenced producer price movements for the energy, food, core goods, and services indexes.

Energy

Crude petroleum prices surged 17.8 percent in the final 3 months of 2016. The index for crude petroleum climbed an additional 17.4 percent in 2017. Similarly, spot prices for West Texas Intermediate crude oil rose from $45.18 in September 2016 to $51.97 in December 2016 and grew to $57.88 by the close of 2017. Internationally, the corresponding spot-price dollar figures for Brent (North Sea) crude were $46.57, $53.31, and $64.37, respectively.[6] The U.S. Energy Information Administration reported that field production of crude oil in the United States, based on an analysis of 4-week moving averages, increased 11.3 percent from the final week of 2016 to the final week of 2017. Average daily U.S. field production rose from 8,780 thousand barrels per day during the final week of 2016 to 9,776 thousand barrels per day at the close of 2017.[7] However, over the same period, U.S. net inputs of crude oil to refineries grew 4.0 percent, to 17,255 thousand barrels per day.[8]

Worldwide, global production of crude oil changed little in 2017. Comparing the averages for 2016 and 2017, worldwide production grew from 80,678 thousand barrels per day to 81,034 barrels per day.[9] In late 2016, the Organization of Oil Producing Countries (OPEC), along with other cooperating nations, agreed to production limits in an effort to limit global supplies and raise crude oil prices.[10] In late 2017, OPEC and the cooperating nations extended that agreement.[11] In response to the activities in the crude petroleum market, the PPI for refined petroleum products—an index including gasoline, diesel fuel, heating oil, and jet fuel—climbed 22.8 percent in 2017, after advancing 12.8 percent in the preceding year.

Augmenting the supply-side price pressure for petroleum products, the demand-side outlook for economic growth improved in 2017. Worldwide economic growth accelerated in 2017 and is projected to remain relatively strong through 2019. According to the Organization for Economic Co-operation and Development (OECD), growth in real GDP was estimated to be 3.6 percent among OECD nations in 2017, compared with growth of 3.1 percent in 2016 and 3.3 percent in 2015. In addition, the OECD projects member-area GDP growth of 3.7 percent in 2018 and 3.6 percent in 2019.[12]

In the natural gas sector, the index for wellhead natural gas fell 11.9 percent in 2017, after surging 55.2 percent in 2016. Although the index for natural gas at the close of 2017 was nearly double the near-term low observed in early 2016, from a long-term perspective, natural gas prices have remained weak relative to their levels over the last two decades. In November 2017, U.S. natural gas marketed production averaged 2.49 million cubic feet per month, an 8.0-percent jump from its November 2016 level.[13] Total consumption grew 8.7 percent over this period. In November 2017, the inventory of working gas in underground storage remained ample, although slightly below its November 2016 level. In 2017, for the second consecutive year, the share of natural gas

allocated to electric power generation (31.8 percent) surpassed that of coal (30.0 percent).[14] In addition, solar generation and other renewable-energy generation (excluding hydroelectric) were responsible for 1.4 percent and 8.3 percent of electric power generation, respectively.[15] Paralleling the mixed market for wellhead natural gas, the index for utility natural gas moved higher in 2017, following a larger rise in 2016.

Food

In 2017, an upturn in prices for protein products was a major contributor to the reversal in food prices. The index for slaughter cattle increased 6.1 percent in 2017, after falling 8.1 percent a year earlier. Prices for slaughter hogs climbed 14.0 percent, following a 4.0-percent decline in 2016. Similarly, the prices for meats moved up 3.4 percent in 2017, after decreasing in the prior year. The U.S. Department of Agriculture reported that total domestic beef production advanced 4.3 percent in 2017, to 26.3 billion pounds, while pork production grew by 2.5 percent, to 25.6 billion pounds. However, through October 2017, exports of beef grew by 14.3 percent and exports of pork rose 9.5 percent. These increases helped strengthen meat prices despite rising production.[16]

Additionally, the indexes for unprocessed eggs and processed eggs both surged in 2017, following declines in 2016. Prices for eggs have been volatile in the aftermath of the outbreak of highly pathogenic avian influenza (HPAI) in 2015. The HPAI outbreak originally caused egg production to drop by about 20 percent, increasing prices by more than 100 percent. Production levels have subsequently recovered, although continued disruptions in egg production and increases in exports have contributed to continued price increases.[17]

Lastly, the market for fresh and dry vegetables experienced a substantial upturn in prices in 2017. Prices for fresh and dry vegetables reversed course, surging 28.2 percent following a 28.2-percent drop in 2016. Though volatile in their movements in 2017, the prices for potatoes, tomatoes, and dry onions all exhibited pricing strength relative to a year earlier. For potatoes, the 2017 U.S. harvest was down 1.9 percent from 2016, while potato exports grew roughly 4.6 percent over the same period.[18]

Core goods

Led by sustained strength in prices for crude oil, inflation for processed goods other than foods and energy continued to accelerate in 2017. The indexes for industrial chemicals, plastic resins and materials, and plastic products climbed at higher rates than they had in 2016. In the metals market, after surging in the fourth quarter of 2016, persistent inflation for iron and steel scrap, nonferrous metal ores, and nonferrous scrap contributed to advances in the indexes for steel mill products, fabricated structural metal products, and nonferrous mill shapes. Increased demand from foreign manufacturers has spurred U.S. exports, helping to pull prices higher.[19] Within the index for final-demand goods less foods and energy, higher prices for industrial chemicals, resinous materials, and plastic products accounted for over 60 percent of the acceleration in the rate of producer inflation. These goods represent some of the more highly weighted, domestically produced goods U.S. companies export, and growing inflation for these goods accounted for most of the higher rate of advance in prices for final-demand goods for export, excluding foods and energy.

Services

The margin index for final-demand trade services moved up 1.8 percent in 2017, compared with a 1.0-percent rise in 2016, and accounted for over half of the faster rate of advance in prices for final-demand services. (Trade

indexes measure changes in margins received by wholesalers and retailers.) Margins for chemicals and allied products wholesaling; fuels and lubricants retailing; and apparel, footwear, accessories, and retailing turned up in 2017 after falling in the prior year. Higher factory gate prices for chemicals, fuels, and apparel, as well as improving economic conditions, were contributing factors to the acceleration in inflation. Higher wholesale trade margins for chemicals, as well as for machinery and equipment parts and supplies wholesaling, also were major contributors to the faster rate of advance for intermediate-demand trade services.

Equity markets prospered in 2017: the Dow Jones Industrial Average, NASDAQ Composite Index, and the S&P 500 Index all climbed in 2017.[20] As a result, the indexes for portfolio management and investment banking services also rose more than they had a year earlier. Interest-rate hikes by the U.S. Federal Reserve in December 2016 and in March, June, and December 2017 led to larger increases in prices for securities brokerage, dealing, investment advice, and related services and an upturn in prices for residential real estate loans (partial) in 2017.[21] In aggregate, these advances were substantial contributors to the larger increases in 2017 in prices for both final-demand services and intermediate-demand services.

In response to higher prices for refined petroleum products, stronger economic growth, worker shortages, and limited transport capacity, the indexes for both intermediate-demand transportation and warehousing services and final-demand transportation and warehousing services moved up at quicker rates in 2017 than they had in 2016. This acceleration was broadbased across the transportation services sector—including rail transportation of freight, long-distance motor carrying, deep-sea water transportation of freight, and both ground-based and air-based package delivery services.[22]

Final demand

This section describes producer inflation for final-demand goods and services—producer price movements of goods and services for households, capital investment, government, and export.

Final-demand goods

In 2017, the faster rate of increase in the index for final demand was led by prices for final-demand goods, which rose 3.5 percent, after advancing 1.9 percent in 2016. The index for final-demand energy accounted for almost 40 percent of the acceleration in final-demand goods, jumping 10.1 percent, following a 6.3-percent increase a year earlier. Prices for final-demand goods less foods and energy also rose more in 2017, moving up 2.2 percent, after increasing 1.7 percent in the previous year. The index for final-demand foods turned up 2.0 percent, following a 1.6-percent decline in 2016.

A major factor in the faster rise in prices for final-demand goods was the index for gasoline, which jumped 15.6 percent in 2017, after climbing 12.0 percent in the preceding year. Prices for diesel fuel and plastic resins and materials also rose more than they had in 2016. The indexes for fresh and dry vegetables, meats, and chicken eggs turned up after falling a year earlier. Conversely, the index for iron and steel scrap increased 18.5 percent in 2017, compared with a 63.7-percent surge in the preceding year. Prices for liquefied petroleum gas also advanced at a slower rate in 2017, while the index for processed young chickens turned down, after increasing in 2016.

Final-demand services

The index for final-demand services advanced 2.1 percent in 2017, after rising 1.6 percent in 2016. Over half of the broad-based acceleration can be traced to margins for final-demand trade services, which moved up 1.8 percent, following a 1.0-percent rise in the previous year. Prices for final-demand services less trade, transportation, and warehousing advanced 2.3 percent in 2017, after a 2.0-percent increase in the previous year. The index for final-demand transportation and warehousing services moved up 2.3 percent, following a 1.1-percent rise in 2016.

Over half of the acceleration in rising prices for final-demand services can be traced to margins for chemicals and allied products wholesaling, which turned up 6.0 percent in 2017, compared with a 13.2-percent drop in the prior year. The indexes for fuels and lubricants retailing; apparel, footwear, and accessories retailing; and mining services also rose, after falling in 2016. Prices for truck transportation of freight and portfolio management increased at faster rates than in the previous year. In contrast, margins for machinery and equipment wholesaling advanced at a slower rate, rising 0.9 percent in 2017, following a 5.3-percent advance in the preceding year. Prices for securities brokerage, dealing, and investment advice and airline passenger services turned down after increasing in 2016.

Intermediate demand by commodity type

This section describes producer inflation for intermediate-demand goods and services—producer price movements for business-to-business sales of processed goods, unprocessed goods, and services. The intermediate-demand portion of the FD-ID aggregation system excludes sales of capital equipment, sales to government, and exports.

Processed goods for intermediate demand

The index for processed goods for intermediate demand rose 5.0 percent in 2017, after advancing 1.8 percent in 2016. The broad-based acceleration in prices for processed goods for intermediate demand was led by the index for processed energy goods, which advanced 13.5 percent in 2017, following a 4.2-percent rise in the previous year. Prices for processed materials less foods and energy increased 3.6 percent, after moving up 1.6 percent in 2016. The index for processed foods and feeds turned up 1.0 percent, after decreasing 0.4 percent in 2016.

Within the index for processed goods for intermediate demand, the increase in prices for diesel fuel reached 40.9 percent in 2017, from 21.4 percent a year earlier. The indexes for industrial chemicals, electric power, and plastic resins and materials also rose more than in 2016. Prices for plastic products increased in 2017, after no change in the previous year, while the index for processed eggs turned up, after declining in 2016. Conversely, the rise in prices for liquefied petroleum gas slowed to 15.8 percent in 2017, from 76.2 percent in the prior year. The index for cold rolled steel sheet and strip also advanced less than in 2016. Prices for soybean cake and meal turned down, after rising in the preceding year.

Unprocessed goods for intermediate demand

The rise in the index for unprocessed goods for intermediate demand slowed to 5.0 percent in 2017, down from 13.0 percent in 2016. Leading the deceleration, prices for unprocessed energy goods advanced only 4.1 percent, after jumping 34.7 percent a year earlier. The index for unprocessed nonfood materials less energy moved up 8.5 percent, following a 13.7-percent rise in 2016. In contrast, prices for unprocessed foodstuffs and feedstuffs turned up 3.0 percent in 2017, after declining 1.8 percent in the prior year.

A major factor in the deceleration for unprocessed goods for intermediate demand was the advance in prices for crude petroleum, which slowed to 17.4 percent in 2017, down from 48.7 percent a year earlier. Prices for iron and steel scrap also rose less than they had in 2016. The indexes for natural gas, raw milk, oilseeds, and wastepaper turned down in 2017, following increases in the preceding year. Conversely, the index for slaughter cattle turned up 6.1 percent in 2017, after decreasing 8.1 percent a year earlier. Prices for grains also rose, after falling in 2016. The index for construction sand, gravel, and crushed stone advanced more than it had in the previous year.

Services for intermediate demand

In 2017, the rise in the index for services for intermediate demand accelerated to 2.9 percent, up from 2.6 percent in 2016. Margins for trade services for intermediate demand jumped 4.0 percent in 2017, compared with a 0.6-percent increase a year earlier. Prices for transportation and warehousing services for intermediate demand also rose, advancing 2.9 percent, following a 0.2-percent rise in 2016. In contrast, the increase in the index for services less trade, transportation, and warehousing for intermediate demand slowed to 2.8 percent in 2017, down from 3.5 percent in the prior year.

Within the index for services for intermediate demand, margins for chemicals and allied products wholesaling turned up 6.0 percent in 2017, after dropping 13.2 percent in the previous year. Prices for courier, messenger, and U.S. postal services and deposit services (partial) also turned up, after declining in 2016. The indexes for portfolio management, services related to securities brokerage and dealing, and machinery and equipment parts and supplies wholesaling advanced more in 2017 than they had in the prior year. Conversely, prices for securities brokerage, dealing, and investment advice fell 8.8 percent, following an 8.1-percent rise in 2016. The indexes for building materials, paint, and hardware wholesaling and airline passenger services also turned down in 2017, after advancing in the previous year.

Intermediate demand by production flow

The production-flow treatment of intermediate demand is a stage-based system of price indexes. The stage-based indexes can be used to study price-transmission relationships among the sequential intermediate-demand stages and between stage-4 intermediate demand and final demand. The production-flow system contains four main indexes, each corresponding to one of four stages of intermediate demand (stages 1 through 4). Indexes for the four stages were developed by assigning each industry to a stage. Industries assigned to the fourth stage primarily produce output consumed for final demand. Industries assigned to the third stage primarily produce output consumed by stage-4 industries. Industries assigned to the second stage primarily produce output consumed by stage-3 industries. And industries assigned to the first stage produce output primarily

consumed by stage-2 industries. These four stage-based, intermediate-demand indexes track price change for the *net inputs consumed by industries assigned to each of the four stages*. The stage-4 intermediate-demand index, for example, tracks price change for inputs consumed by industries included in the fourth stage. Hence, this index measures price change in the inputs to production for industries that primarily produce final-demand goods, services, and construction. Because of the positioning of stage 1 in this system, the inputs included are primarily produced by industries categorized in stages 2 through 4. As a result, stage 1 provides limited analytical value in terms of inflation pass-through analysis.

From a timing standpoint, price movements in 2017 within intermediate demand by production flow can be broken down into three main periods: the final quarter of 2016 through June 2017, the first quarter of 2017 through September 2017, and the second quarter of 2017 through December 2017. (See table 2.) During period 1, in the final quarter of 2016, the index for stage-2 intermediate demand surged. In particular, prices for crude oil, natural gas, metals, and financial services moved higher. This pricing pressure appears to have passed through stages 3 and 4 of the production flow system by the end of the first quarter of 2017, lasting through to the end of the second quarter of 2017. During period 2, prices for stage-2 intermediate demand retreated in the first quarter of 2017. Subsequently, the rate of price increase for stage-3 and stage-4 intermediate demand decelerated in the second and third quarters, respectively. Finally, in the third period, starting in the second quarter of 2017, rising inflation in stage 2 for both goods and services appears to have passed though stages 3 and 4 in the third and fourth quarters of 2017. These price movements are not unlike those observed in the index for final demand, which moved up at quicker rates at both the beginning and end of 2017.[23]

Table 2. Selected producer price indexes for intermediate demand, by production flow, 3-month seasonally adjusted annual rate, December 2016 to December 2017

Index	December 2016	March 2017	June 2017	September 2017	December 2017
Stage 4 intermediate demand	2.6(1)	4.0(1)	3.6(1)	1.8(2)	4.3(3)
Total goods inputs to stage-4 intermediate demand	2.3(1)	4.6(1)	2.6(1)	2.2(2)	4.1(3)
Total services inputs to stage-4 intermediate demand	3.6(1)	2.9(1)	4.3(1)	1.8(2)	3.9(3)
Stage 3 intermediate demand	7.3(1)	7.1(1)	1.4(2)	2.5(3)	8.5(3)
Total goods inputs to stage-3 intermediate demand	11.2(1)	10.9(1)	-0.4(2)	3.2(3)	12.2(3)
Total services inputs to stage-3 intermediate demand	3.7(1)	2.9(1)	3.6(2)	2.1(3)	4.3(3)
Stage 2 intermediate demand	10.4(1)	-1.6(2)	4.0(3)	3.6(3)	9.2(3)
Total goods inputs to stage-2 intermediate demand	20.9(1)	-5.9(2)	3.3(3)	8.2(3)	16.5(3)
Total services inputs to stage-2 intermediate demand	3.3(1)	2.5(2)	4.0(3)	0.7(3)	3.9(3)

(1) Period-1 data points.
(2) Period-2 data points.
(3) Period-3 data points.
Note: Seasonally adjusted data in this table will be revised annually from 2019 through 2022 to account for updated seasonal adjustment factors.
Source: U.S. Bureau of Labor Statistics.

Stage-4 intermediate demand

The index for stage-4 intermediate demand advanced 3.4 percent in 2017, after rising 1.7 percent in the previous 12-month period. Price increases for total goods inputs to stage-4 intermediate demand accelerated 3.4 percent, up from 1.1 percent in 2016. The index for total services inputs to stage-4 intermediate demand climbed 3.2 percent in 2017, following a 2.4-percent rise in the prior year. In 2017, prices for diesel fuel jumped 40.9 percent, after increasing 21.4 percent a year earlier. The indexes for portfolio management, machinery and equipment parts and supplies wholesaling, and electric power also advanced more than they had in 2016. Margins for chemicals and allied products wholesaling turned up in 2017, while the index for plastic products rose, after no change in 2016. In contrast, prices for securities brokerage, dealing, and investment advice turned down 8.8 percent in 2017, following an 8.1-percent advance in the preceding year. The indexes for building materials, paint, and hardware wholesaling and for natural, processed, and imitation cheese also fell after increasing in 2016.

Stage-3 intermediate demand

The index for stage-3 intermediate demand advanced 4.8 percent in 2017, after rising 2.0 percent in the prior year. Prices for total goods inputs to stage-3 intermediate demand moved up 6.3 percent, compared with a 1.8-percent rise in 2016. The increase in the index for total services inputs to stage 3 intermediate demand accelerated to 3.3 percent in 2017, up from 2.1 percent a year earlier. Prices for slaughter cattle rose 6.1 percent, following an 8.1-percent decline in 2016. The indexes for courier, messenger, and U.S. postal services; chemicals and allied products wholesaling; ungraded chicken eggs; and slaughter hogs also turned up in 2017. Prices for industrial chemicals increased more in 2017 than they had in 2016. Conversely, prices for raw milk turned down 8.5 percent in 2017, following an 11.5-percent advance a year earlier. The indexes for securities brokerage, dealing, and investment advice and building materials, paint, and hardware wholesaling also declined, after rising in 2016.

Stage-2 intermediate demand

The increase in the index for stage-2 intermediate demand slowed to 3.7 percent in 2017, from 6.4-percent rise in 2016. Prices for total goods inputs to stage-2 intermediate demand advanced 5.1 percent in 2017, after climbing 11.1 percent in the previous year. The index for total services inputs to stage-2 intermediate demand moved up 2.7 percent, compared with a 3.2-percent rise in 2016. Prices increases for crude petroleum slowed to 17.4 percent, from 48.7 percent in the preceding year. The index for liquefied petroleum gas also increased less in 2017 than it had in the prior year. Prices for natural gas; securities brokerage, dealing, and investment advice; oilseeds; and television advertising time sales turned down, after rising in 2016. In contrast, the index for thermoplastic resins and plastics materials jumped 11.6 percent, after no change in the previous year. Prices for portfolio management advanced more in 2017 than they had the previous year. Prices for paperboard turned up, after falling in 2016.

Stage-1 intermediate demand

The index for stage-1 intermediate demand increased 5.7 percent in 2017, following a 4.4-percent rise in 2016. Prices for total goods inputs to stage-1 intermediate demand climbed 8.1 percent, compared with a 6.4-percent advance in 2016. The index for total services inputs to stage-1 intermediate demand moved up 2.6-percent in

2017, after rising 2.1 percent in the prior year. Prices for industrial chemicals jumped 10.1 percent in 2017, following a 5.0-percent increase in the preceding year. The indexes for diesel fuel, electric power, and services related to securities brokerage and dealing also rose more than they had in 2016. The indexes for chemicals and allied products wholesaling and for deposit services (partial) turned up in 2017, following declines in the previous year. Conversely, prices for iron and steel scrap advanced 18.5 percent in 2017, compared with a 63.7-percent jump a year earlier. The indexes for securities brokerage, dealing, and investment advice, and natural gas turned down, after rising in 2016.

Conclusion

In 2017, inflation, as measured by producer-price indexes, generally grew at a faster rate than it had in 2016. This acceleration in the rate of price increase was broad based. Prices for final-demand goods, services, and construction rose more in 2017 than they had in the preceding year. At the earlier stages of production, prices for business-to-business sales of processed goods and services also moved up at a faster rates, while prices for unprocessed goods rose at a slower rate than they had in 2016.

SUGGESTED CITATION

Joseph Kowal, Lana Conforti, Brian Hergt, and Scott Sager, "Producer prices, 2017: inflation accelerates across the stages of production," *Monthly Labor Review,* U.S. Bureau of Labor Statistics, June 2018, https://doi.org/10.21916/mlr.2018.16.

NOTES

1 Revised PPI data for December 2017 were posted on May 9, 2018, with the release of first-issued data for April 2018. All PPI data are recalculated 4 months after original publication to reflect late reporting by survey respondents.

2 The Final Demand–Intermediate Demand (FD–ID) system was first introduced in January 2011 as a set of experimental indexes. With the release of data for January 2014, the FD–ID system replaced the Stage of Processing (SOP) system. Nearly all new FD–ID goods, services, and construction indexes provide historical data back to either November 2009 or April 2010, while the indexes for goods that correspond to the historical SOP indexes go back to the 1970s or earlier. For more information about the FD–ID system, see “A new, experimental system of indexes from the PPI program,” *Monthly Labor Review*, February 2011, https://www.bls.gov/opub/mlr/2011/02/art1full.pdf, or visit the PPI FD–ID system webpage at https://www.bls.gov/ppi/fdidaggregation.htm.

3 PPIs for trade services measure changes in margins received by wholesalers and retailers. For more information on these PPIs, see “Wholesale and retail Producer Price Indexes: margin prices,” *Beyond the Numbers: Prices and Spending*, vol. 1, no. 8 (U.S. Bureau of Labor Statistics, August 2012), https://www.bls.gov/opub/btn/volume-1/pdf/wholesale-and-retail-producer-price-indexes-margin-prices.pdf.

4 Historically, the PPIs for food and energy goods have exhibited greater short-term volatility than the PPIs for goods other than food and energy. As a result, the PPI program introduced a number of goods indexes that exclude one or both of these potentially volatile components. With the transition from the SOP to the FD–ID system, PPI continues to produce these indexes. In addition, with the FD–ID expansion to include prices for many services, it has been observed that the indexes for wholesale and retail trade, which measure changes in margins, also are subject to potentially large short-term volatility. Consequently, PPI calculates a

number of indexes that exclude prices for trade services. These indexes include final-demand services less trade services and final-demand less trade services. In addition, PPI calculates an index for final-demand less foods, energy, and trade services, removing all three potentially volatile components.

5 For a detailed discussion of price transmission across stages of processing, see Jonathan Weinhagen, "An empirical analysis of price transmission by stage of processing," *Monthly Labor Review*, November 2002, https://www.bls.gov/opub/mlr/2002/11/art1full.pdf; and Weinhagen, "Price transmission within the PPI for intermediate goods," *Monthly Labor Review*, May 2005, https://www.bls.gov/opub/mlr/2005/05/art4full.pdf. Highly processed, semifinished and completely manufactured goods commonly exhibit price movements that differ from less processed goods because basic material costs tend to be a smaller portion of total costs for producers of highly processed goods than for manufacturers of less processed goods. Contracts and escalation agreements also can delay or mitigate the pass-through effect of early stage price volatility on successive stages of processing.

6 "Petroleum and other liquids, spot prices" (U.S. Energy Information Administration), https://www.eia.gov/dnav/pet/pet_pri_spt_s1_m.htm.

7 "Petroleum and other liquids, 4-week average U.S. field production of crude oil" (U.S. Energy Information Administration), https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=WCRFPUS2&f=4.

8 "Petroleum and other liquids, 4-week average U.S. refiner net input of crude oil" (U.S. Energy Information Administration), https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=pet&s=wcrrius2&f=4.

9 Data for world crude petroleum production are available at *Monthly Energy Review*, "Table 11.1b, World crude oil production: Persian Gulf nations, non-OPEC, and world" (U.S. Energy Information Administration, May 2018), chap. 11, p. 173, http://www.eia.gov/totalenergy/data/monthly/pdf/sec11_5.pdf.

10 The text of the 2016 OPEC and allied nations agreement to cut crude petroleum production is available at http://www.opec.org/opec_web/static_files_project/media/downloads/press_room/OPEC%20agreement.pdf.

11 For a description of the decision to extend this agreement, see *Declaration of cooperation* (OPEC, November 30, 2017), http://www.opec.org/opec_web/en/press_room/4696.htm.

12 See *OECD Economic Outlook* (Organisation for Economic Co-operation and Development), vol. 2017, no. 2, p. 12, http://www.keepeek.com/Digital-Asset-Management/oecd/economics/oecd-economic-outlook-volume-2017-issue-2_eco_outlook-v2017-2-en.

13 For more information about natural gas supply and consumption, see "Natural gas monthly" (U.S. Energy Information Administration), http://www.eia.gov/naturalgas/monthly/. For data specific to natural gas marketed production, see table 7. For data specific to natural gas inventory, select table 8. For data specific to natural gas consumption, see table 2. For more information about natural gas markets, see "Natural gas" (U.S. Energy Information Administration), http://www.eia.gov/naturalgas/.

14 For data specific to sources of electric power generation, see "Electric power monthly, table 1.1, net generation by energy source: total (all sectors), 2008–March 2018" (U.S. Energy Information Administration), https://www.eia.gov/electricity/monthly/epm_table_grapher.php?t=epmt_1_01.

15 Renewable sources, other than solar and hydroelectric, include wood, black liquor, other wood waste, biogenic municipal solid waste, landfill gas, sludge waste, agriculture byproducts, other biomass, geothermal, solar thermal, photovoltaic energy, and wind.

16 Mildred Haley, "Livestock, dairy, and poultry outlook," LDP-M-282 (U.S. Department of Agriculture, December 18, 2017), pp. 4, 13, and 22, www.ers.usda.gov/webdocs/publications/86243/ldp-m-282.pdf. For information about beef and pork production, see page 22. For information about beef exports, see page 4. For information about pork exports, see page 13.

17 Ibid, pp. 16–18.

18 *Crop production*, ISSN: 1936-3737 (U.S. Department of Agriculture, November 9, 2017), p. 13, https://www.nass.usda.gov/Publications/Todays_Reports/reports/crop1117.pdf; Tom Karst, "U.S. potato exports set record for 2017," *The Packer*, February 23, 2018, https://www.thepacker.com/article/us-potato-exports-set-record-2017.

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20 For information on these and other financial-sector measures, see "US market overview," *MarketWatch*, https://www.marketwatch.com/tools/marketsummary.

21 For a history of open-market operations executed by the Board of Governors of the Federal Reserve System, see "Policy tools," *Board of Governors of the Federal Reserve System,* https://www.federalreserve.gov/monetarypolicy/openmarket.htm.

22 Eric M. Johnson, "Corporate America's new dilemma: raising prices to cover higher transport costs," *Reuters*, February 26, 2018, https://www.reuters.com/article/us-usa-freight-transportation-insight/corporate-americas-new-dilemma-raising-prices-to-cover-higher-transport-costs-idUSKCN1GA0DS. For a discussion of fuel surcharges and their influence on transportation prices, see "Current price topics: the impact of fuel surcharges on the PPI," *Focus on Prices and Spending*, vol. 2, no. 6 (U.S. Bureau of Labor Statistics, August 2011), https://www.bls.gov/opub/btn/archive/producer-price-indexes-the-impact-of-fuel-surcharges-on-the-ppi.pdf.

23 For data related to services by production flow, on a 3-month, rate-of-change basis, see total stage-4 services inputs, total stage-3 services inputs, and total stage-2 services inputs. For goods, see total stage-4 goods inputs, total stage-3 goods inputs, and total stage-2 goods inputs. For the overall stage indexes, see total stage-4 inputs, total stage-3 inputs, and total stage-2 inputs.

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